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10/501,097	07/09/2004	Kazuhiro Yamada	040302-0398	3096

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EXAMINER	
CHUO, TONY SHENG HSIANG	
ART UNIT	**PAPER NUMBER**
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MAIL DATE	**DELIVERY MODE**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/501,097	YAMADA, KAZUHIRO	
	Examiner	Art Unit	
	Tony Chuo	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,19,20,23 and 24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,19,20,23 and 24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/15/07 has been entered.

Response to Amendment

2. Claims 1-17, 19, 20, 23, and 24 are currently pending. Claims 18, 21, and 22 have been cancelled. New claims 23 and 24 have been added. The amended claims do overcome the previously stated 103 rejections. However, upon further consideration, claims 1-17, 19, 20, 23, and 24 are rejected under the following new 112 and 103 rejections.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 17, 19, and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 17 recites the limitation "the first antifreeze circulation means" in line 9. There is insufficient antecedent basis for this limitation in the claim.

6. Claims 19 and 20 recite the limitations "the second antifreeze circulation flow passage" and "the second antifreeze circulation means" in lines 1 and 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 7, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanbara et al (JP 2000-149970) in view of Ozeki et al (JP 2002-367646).

The Kanbara reference discloses a fuel cell system comprising: a fuel cell "1" cooled by cooling water; a water tank "4" adapted to store water to be supplied to the fuel cell; a circulation flow passage "16" adapted to allow the cooling water to be circulated from the fuel cell where the cooling water cooled the fuel cell to the water tank; a heater "15" disposed in the circulation flow passage to heat the cooling water; and a hot medium flow passage "16" that allow the heated cooling water to circulate around the perimeter of the water tank (See paragraphs [0012],[0013] and Drawing 1). It also discloses a hot medium flow passage "16" that has an inlet located at a higher

position than an outlet (See Drawing 1). It also discloses cooling water that is heated by the heater "15" that heats the fuel cell and heats the water in the water tank while flowing through the hot medium flow passage (See paragraph [0013]).

Examiner's note: It is inherent that the hot medium flow passage "16" is conforming, in a contacting relationship, to a water contact section on an outside of the water tank to allow the cooling water to flow around the outside of the water tank.

However, Kanbara et al does not expressly teach a fuel cell that is cooled by antifreeze. The Ozeki reference discloses a cooling pipe "4" that passes through the inside of the fuel cell "1" that circulates either cooling water or an antifreeze solution (See paragraph [0059]).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Ozeki indicates that an antifreeze solution is a suitable material for use as a thermal medium for cooling a fuel cell. The selection of a known material based on its suitability for its intended use has generally been held to be *prima facie* obvious (MPEP §2144.07). As such, it would be obvious to use antifreeze.

9. Claims 1, 7, 13, 16, 17, 19, 20, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970).

The Saito reference discloses a fuel cell system comprising: a fuel cell "1" that is cooled by antifreeze solution; a moisture supply means "26" consisting of a water tank and a pump that is adapted to store water to be supplied to the fuel cell; an antifreeze

circulation flow passage; an antifreeze heating means "11" disposed in the antifreeze circulation flow passage to heat the antifreeze solution; and a second antifreeze circulation flow passage that allows the antifreeze solution to be circulated that includes: the fuel cell "1", the hot medium flow passage; and a radiator disposed "13" in the antifreeze circulation flow passage adapted to radiate heat from the antifreeze solution, wherein the second antifreeze circulation flow passage branches away from the first antifreeze circulation flow passage (See Drawing 3 and paragraphs [0058],[0060], [0071],[0090]). It also discloses an antifreeze bypass valve "16" that is used to avoid heat dissipation from the radiator "13" at the time of heating during startup, wherein after the system startup is operated steadily, the antifreeze bypass valve is closed (See paragraphs [0060],[0061]).

However, Saito et al does not expressly teach an antifreeze circulation flow passage that is adapted to allow the antifreeze solution to be circulated from the fuel cell to the water storage unit; a hot medium flow passage disposed around and conforming, in a contacting relationship, to a water contact section on an outside of the water storage unit to allow the antifreeze solution, heated by the antifreeze heater, to flow around the outside of the water storage unit, wherein the hot medium flow passage has an antifreeze inlet, through which the antifreeze solution flows in, that is located at a higher position than an antifreeze solution outlet, through which the antifreeze solution flows out, wherein the antifreeze solution heated by the antifreeze heater heats the fuel cell and heats the water in the water storage unit while flowing through the hot medium

flow passage; and a water temperature detector adapted to detect a water temperature in the water storage unit.

The Kanbara reference discloses a circulation flow passage/hot medium flow passage "16" that is adapted to allow a heated cooling medium to be circulated from the fuel cell "1" to the water tank "4" to heat the water in the water tank, wherein the hot medium flow passage is disposed around the perimeter of the water tank and has an inlet located at a higher position than an outlet (See paragraphs [0012],[0013] and Drawing 1). It also discloses a control unit that judges the temperature of the water that is solidified in the water tank (See paragraph [0013]). Examiner's note: It is inherent that the hot medium flow passage "16" is conforming, in a contacting relationship, to a water contact section on an outside of the water storage unit to allow the cooling medium to flow around the outside of the water tank.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Saito fuel cell system to include an antifreeze circulation flow passage that is adapted to allow the antifreeze solution to be circulated from the fuel cell to the water storage unit; a hot medium flow passage disposed around and conforming, in a contacting relationship, to a water contact section on an outside of the water storage unit to allow the antifreeze solution, heated by the antifreeze heater, to flow around the outside of the water storage unit, wherein the hot medium flow passage has an antifreeze inlet, through which the antifreeze solution flow in, that is located at a higher position than an antifreeze solution outlet, through which the antifreeze solution flows out, wherein the antifreeze solution heated by the antifreeze

heater heats the fuel cell and heats the water in the water storage unit while flowing through the hot medium flow passage; and a water temperature detector adapted to detect a water temperature in the water storage unit in order to allow the fuel cell system to be stabilized and put into operation under low temperature environments where water in the water tank can be frozen during startup (See paragraph [0018]).

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970) as applied to claim 1 above, and further in view of Koizumi et al (US 4818845).

However, Saito et al as modified by Kanbara et al does not expressly teach a suction conduit heater section disposed around a periphery of a water suction conduit of the water pump to allow the heated antifreeze solution to flow. The Koizumi reference discloses an electric heater "24" disposed around a periphery of a water suction pipe "23" of the bubble pump "20" (See Figure 1 and column 3 line 62 to column 4 line 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Kanbara fuel cell system to include a suction conduit heater section disposed around a periphery of a water suction conduit of the water pump to allow the heated antifreeze solution to flow in order to prevent the water suction conduit and the hot medium flow passage inlet from freezing under cold temperature environments.

11. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970) as applied to claim 1 above, and further in view of Gerstmann et al (US 5772113).

However, Saito et al as modified by Kanbara et al does not expressly teach an antifreeze rectification plate disposed in the hot medium flow passage to guide flow of the antifreeze solution; a hot medium flow passage that is disposed along at least a portion of an inner wall of the water storage unit; and a hot medium flow passage that is formed in a plurality of flow passage components that are stacked and water tightly sealed, and wherein the plurality of flow passage components form at least a portion of a side wall of the water storage unit, wherein the hot medium flow passage is formed in a spiral shape. The Gerstmann reference discloses a coolant-to-water heat exchanger "55" that surrounds the water storage tank "31" wherein hot coolant passes through the coil "80" that is wrapped around the tank in a helical fashion or multiple parallel coils (See column 4, lines 50-62 and Figure 2A).

Examiner's note: The antifreeze rectification plate is construed as the flattened part of the tubing that wraps around the water storage tank taught by Gerstmann et al (See column 2, lines 5-6). The stacked hot medium flow passage components that forms at least a portion of a side wall of the water storage unit is construed as the parallel coils wrapped around the water tank taught by Gerstmann et al.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Kanbara fuel cell system to include an antifreeze rectification plate disposed in the hot medium flow passage to guide flow of the antifreeze solution; a hot medium flow passage that is disposed along at least a portion of an inner wall of the water storage unit; and a hot medium flow passage that is formed in a plurality of flow passage components that are stacked and water tightly

sealed, and wherein the plurality of flow passage components form at least a portion of a side wall of the water storage unit, wherein the hot medium flow passage is formed in a spiral shape in order to more efficiently transfer the heat from the hot medium flow passages to the water tank by improving the thermal contact between the flow passages and the water tank.

12. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970) as applied to claim 1 above, and further in view of Breault et al (US 6699612).

However, Saito et al as modified by Kanbara et al does not expressly teach a switch-over unit adapted to expel the antifreeze solution from the hot medium flow passage to allow air to be admitted to the hot medium flow passage in place of the expelled antifreeze solution; and an antifreeze accommodating unit that, when the hot medium flow passage is admitted with air in place of the antifreeze solution, allows the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated. The Breault reference discloses a drain vent "160" and drain valve "158" that are controlled to admit air to assist in the drainage of the antifreeze coolant and a coolant accumulator "64" that allow the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated (See column 9, lines 45-52 and Figure 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Kanbara fuel cell system to include a switch-over unit adapted to expel the antifreeze solution from the hot medium flow

passage to allow air to be admitted to the hot medium flow passage in place of the expelled antifreeze solution; and an antifreeze accommodating unit that, when the hot medium flow passage is admitted with air in place of the antifreeze solution, allows the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated in order to avoid degradation of the antifreeze coolant in the start-up heat exchanger by draining the antifreeze coolant.

13. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Yamada et al (US 5482790).

However, Saito et al as modified by Kanbara et al and Breault et al does not expressly teach air to be admitted to the hot medium flow passage in place of the antifreeze solution that includes combustion gas resulting from a combustor disposed in the antifreeze heater. The Yamada reference discloses air heated by mixing the combustion gas from the reforming unit with the air that is fed to the cooling plate "12d" which is part of the cooling flow passage (See column 15, lines 27-30).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Kanbara/Breault fuel cell system to include air to be admitted to the hot medium flow passage in place of the antifreeze solution that includes combustion gas resulting from a combustor disposed in the antifreeze heater in order to shorten the period of time that elapses during the initial

time until the generation of electric energy is started with the fuel cell by using combustion gas to heat the fuel cell (See column 15, lines 37-44).

14. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Roberts et al (US 2001/0055707).

However, Saito et al as modified by Kanbara et al and Breault et al does not expressly teach an air storage unit storing air to be introduced into the hot medium flow passage in place of the antifreeze solution. The Roberts reference discloses purging the coolant water passages by circulating compressed air through them (See paragraph [0049]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Kanbara/Breault fuel cell system to include an air storage unit storing air to be introduced into the hot medium flow passage in place of the antifreeze solution in order to speed the draining of the antifreeze solution from the hot medium flow passage by using compressed air.

15. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Bonville (US 6248462).

However, Saito et al as modified by Kanbara et al and Breault et al does not expressly teach an antifreeze temperature detector adapted to detect the temperature of the antifreeze solution in the hot medium flow passage wherein when the

temperature of the antifreeze solution is detected to fall in a value higher than 0 C and lower than alpha.C (.alpha.: heat capacity reference temperature of the antifreeze solution), the antifreeze temperature detector controls the hot medium change-over unit so as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution. The Bonville reference discloses a thermal management apparatus "30" that includes antifreeze temperature sensors that detect the temperature of the antifreeze solution in the coolant flow channels wherein the antifreeze solution transfers a portion of its heat to the fuel cell assemblies and after which the antifreeze flow are exhausted from the fuel cell stack (See column 6, lines 13-25, column 7 line 67 to column 8 line 3).

Examiner's note: The thermal management apparatus taught by Bonville is capable of detecting when the temperature of the antifreeze solution falls in a value higher than 0°C and lower than alpha C to control the hot medium change over unit so as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Kanbara/Breault fuel cell system to include an antifreeze temperature detector adapted to detect the temperature of the antifreeze solution in the hot medium flow passage wherein when the temperature of the antifreeze solution is detected to fall in a value higher than 0 C and lower than alpha.C (.alpha.: heat capacity reference temperature of the antifreeze solution), the antifreeze temperature detector controls the hot medium change-over unit so as to allow

the air to be admitted to the hot medium flow passage in place of the antifreeze solution in order to prevent the antifreeze solution from contaminating the reactant gases after the fuel cell stack is heated above freezing.

16. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Nelson (US 5421475).

However, Saito et al as modified by Kanbara et al and Breault et al does not expressly teach a water storage unit that includes a double-layer structure composed of an inside tank component and an outside tank component, between which the hot medium flow passage is formed, and a heat insulation member with a specific gravity greater than the air and less than the antifreeze solution is moveably received in the hot medium flow passage; wherein the heating member includes a plurality of members smaller in size than a flow sectional area of the hot medium flow passage formed between the inside tank component and the outside tank component. The Nelson reference discloses a foam insulation material that is formed into a movable annular collar "22" between the inner wall surface of the outer shell and the outer wall surface of the inner water tank and tapes "50" that are smaller in size than a flow sectional area of the annular space between the outer shell and inner water tank (See claim 6 and Figure 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Kanbara/Breault fuel cell system to

include a water storage unit that includes a double-layer structure composed of an inside tank component and an outside tank component, between which the hot medium flow passage is formed, and a heat insulation member with a specific gravity greater than the air and less than the antifreeze solution is moveably received in the hot medium flow passage; wherein the heating member includes a plurality of members smaller in size than a flow sectional area of the hot medium flow passage formed between the inside tank component and the outside tank component in order to further improve the thermal efficiency of the water tank by insulating the space between the double layer structure of the tank.

Response to Arguments

17. Applicant's arguments with respect to claims 1-17, 19, 20, 23, and 24 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 7:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

JONATHAN CREPEAU
PRIMARY EXAMINER